A few years ago yet another theory was started, based on M. Quincke's discovery of the tendency of liquid films to expand rapidly upon wetable surfaces. The only advantage of this lay in accounting for the rapidity of the rise of sap; otherwise it was open to all the objections of the Jamin theory.

A theory has lately been propounded, and thoroughly worked out, by M. Joseph Böhm, which is characterised by good consistency, and offers perhaps a more satisfactory explanation of the phenomenon than any that have been referred to. It is based, like the osmotic theory, on the cellular structure of all sap-conducting plants, and it attributes an important *rôle* to the *elasticity of the cells*. "When the surface-cells of a plant," says M. Böhm, "have lost a portion of their water through evaporation, they are somewhat compressed by the air-pressure. Like elastic bladders, however, they tend to take their original form. This of course is only possible by their drawing in either air or water from without. Since, however, moist membranes are little penetrable by air, the cells draw from cells further in a portion of their liquid contents. These again borrow from their neighbours further down, which contain more water, and so on, either to the extreme root-cells or to those parts of the stem which are supplied with water from below through root-pressure."

To illustrate the action M. Böhm constructed an artificial cell-chain. A funnel closed by a bladder represented the evaporating leaf; to it were connected below several glass tubes about two ctm. wide, closed at one end with a bladder, and joined together in series by means of thick-walled caoutchouc-tubing. In consequence of the evaporation, the membrane which closes the funnel-mouth is bent inwards, and when it has reached a certain tension water is sucked into the funnel out of the next lower cell, which covers its loss in like manner. Manometers, connected with certain cells of the apparatus, indicate the amount of suction at different heights. To avoid fouling of the membranes carbolic acid was mixed with the distilled water in the cells. Since bladder membranes, with a not very great height of liquid column over them, admit passage of water by filtration, these artificial cell-chains (it is pointed out) must act much more imperfectly than the sap-conducting cells placed over one another in living plants, which cells, by reason of their narrow aperture, retain their liquid column by capillary attraction.

It is shown that this theory is in harmony with sundry phenomena which are contradictory of the imbibition theory.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

It will be proposed to confer the degree of D.C.L. *honoris causa* at the ensuing Oxford commemoration, upon Dr. William Spottiswoode, M.A., of Balliol College, F.R.S.

The following awards for proficiency in Natural Science have been made at St. John's College, Cambridge:—Foundation Scholarships to F. J. Allen, Marr, Slater, C. M. Stuart; Exhibitions to Fleming, Hart; the Open Exhibition to C. H. O. Curtis, from the Royal School of Mines.

The plans for the new University edifices at Strasburg have just been completed. They provide for over 100 rooms to serve as auditoriums, museums, the inevitable German singing hall and fencing hall, &c., and will meet the needs of all sections of the university, with the exception of the medical faculty, which retains its old quarters, on account of the propinquity to the hospital. The attendance, which has fallen off during the past year, is now greater than ever before, the number of students for the present semester being 710.

SCIENTIFIC SERIALS

Journal de Physique, April.—In this number M. Vincent recommends chloride of methyl as a frigorific agent, and indicates an abundant source of it. He employs a cylindrical copper vessel having double walls, between which the liquid is admitted through a peculiar cock from an adjoining vessel. In the central part is put an uncongealable liquid such as alcohol. The outer wall is enveloped in cork. On opening the cock the chloride of methyl enters into ebullition, and the temperature of the alcohol bath sinks to $-23°$. By connecting with an air pump and making vacuum, a much lower temperature may be obtained. One pretty experiment with this apparatus is the crystallisation of mercury.—M. Gariel explains the new system of numbering glasses of spectacles, in which a unit called the *dioptrie* is used, this being the power of a convergent lens of 1m. focal distance. The number of dioptries for a particular lens is got by dividing 1m. by the focal distance reckoned in metres and decimal fractions of a metre, since the power varies in inverse ratio of the focal distance. Let N_D be the number of a lens reckoned in dioptries and f_m the focal distance in metres, then $N_D f_m = 1m.$, which gives one of the quantities when the other is known.—M. Pellat contributes a mathematical paper on the specific heats of vapours, and the phonograph occupies some attention.

Memorie della Società degli Spettroscopisti Italiani, January, 1878.—Prof. Tacchini contributes a long paper on the appearance and constitution of the sun, based on the photographs of M. Jansen taken at Meudon; there is also another by the same author, giving the observations of the positions in which the magnesium and 1474 lines appeared on the limb of the sun in June, 1877. The appendix contains a paper by L. Gruber on the falling stars of the first part of last November.

February.—Notice of the death of Father Secchi, by the editor.—A paper by Prof. Rosetti on the temperature of the sun; a description of the thermopile and the necessary accessories, together with the results, is given at length.—A table showing the number of spots and protuberances, and the heights of the latter during the first half of the year 1877, and drawings of the chromosphere for the months of November and December made at Rome, by Prof. Tacchini.

March.—A note and table by Prof. Tacchini showing the position on the sun's limb when the magnesium and 1474 lines were seen during June, 1877. Also a summary of the positions of the same during the first half of the year 1877.

SOCIETIES AND ACADEMIES

LONDON

Royal Society.—"Note on the Specific Gravity of the Vapours of the Chlorides of Thallium and Lead," by Henry E. Roscoe, F.R.S., Professor of Chemistry in Owens College, Manchester.

Experimental difficulties of so serious a nature surround the attempt to ascertain the specific gravity of vapours at a high temperature that, in spite of the interest which attaches to this subject, but few additions have been made in our knowledge in this direction since the researches of Deville and Troost.

The present experiments, of which this notice contains the first results, have been made with the object of so simplifying the process as to render it easy to determine the specific gravity of the vapours of bodies possessing high boiling points with a degree of accuracy sufficient for the purpose of controlling their molecular weights.

The method consists in vaporising the substance under examination in long-necked glazed porcelain globes of known capacity placed in a muffle raised to bright redness. The temperature of the globe is ascertained by a calorimetric determination made with heavy platinum weights placed in the muffle, this determination being checked by the simultaneous insertion in the muffle of a second globe containing mercury.

The porcelain globes having a capacity of about 300 cub. centims., and containing from three to nine grams of substance, are closed by loosely-fitting stoppers of baked clay, and then gradually introduced in the muffle. After remaining there until no further escape of vapour is observed, and until the temperature has become constant, the globes are quickly withdrawn from the muffle and their contents removed and analysed, the temperature being in each case ascertained by the calorimetric method at the time of withdrawal of the globe. The following determinations of the specific gravity of mercury vapour serve to show the reliability of the method:—

	Temperature determined calorimetrically.	Specific gravity of mercury vapour.
	°	
Experiment I.	1019	6·92
,, II.	894	6·75
,, III.	815	6·91
,, IV.	972	5·77
,, V.	1047	7·05

the calculated specific gravity (Hg = 198·8) being 6·728.

Before determining the specific gravity of the vapour of thallium chloride it was ascertained that this compound does not

give off free chlorine when volatilised at a red-heat, and that the sublimate contains thallium and chlorine in the atomic ratio of equality.

In each experiment the total amount of thallium and of chlorine remaining in the globe was determined by analysis, and the specific gravity calculated from their sum.

	Temperature determined calorimetrically.	Specific gravity of the vapour of thallium chloride.
Experiment I.	859	8·15
,, II.	828	8·28
,, III.	1015	8·06
,, IV.	859	7·43
,, V.	1026	8·75
,, VI.	852	8·60
,, VII.	837	7·84

The specific gravity of thallium chloride vapour calculated upon the supposition that the molecular weight of the compound is 238·07, and its formula TlCl, is 8·49.

Four determinations of the specific gravity of mercury vapour made simultaneously with four of the above experiments gave as a mean the number 6·0 instead of 6·728.

The specific gravity of the vapour of lead chloride was made in a similar way, but the temperature required for complete volatilisation is much higher than that needed in the case of the last compound. The residue left in the globes was completely soluble in hot water, and contained lead and chlorine in the proportion of one atom of the former to 2·08 of the latter.

	Temperature determined calorimetrically.	Specific gravity of the vapour of lead chloride.
Experiment I.	1046°	9·12
,, II.	1089	9·72
,, III.	1077	9·51
,, IV.	1070	9·64

The specific gravity calculated from the formula $PbCl_2 = 277{\cdot}14$ is 9·62.

I hope before long to be able to lay before the Society the results of specific gravity determinations of the vapours of other compound and elementary bodies, together with the whole of the experimental details.

Anthropological Institute, May 14.—Mr. John Evans, D.C.L., F.R.S., president, in the chair.—Capt. Dillon exhibited a series of flint implements, collected in the neighbourhood of Ditchley, Oxfordshire, and a number of others, from the drift gravel of the sea valley near Clapton, were exhibited by Mr. Worthington G. Smith. The following papers were read by the author, Prof. Rolleston, M.P., F.R.S.—Description of a male skeleton found at Cissbury by Mr. J. Park Harrison. The paper was illustrated by a semidiagrammatic of the pit whence the skeleton had come; the principal parts of the skeleton itself, some bones of ox, goat, pig, and red deer, and finally, a large quantity of worked flints and some lumps of iron pyrites were upon the table. Much help had been received as to the preservation of the skeleton from Dr. Kelly, the Medical Officer of Health for the district. There was no doubt the skeleton had belonged to a man with a markedly dolichocephalic skull, the length-breadth index being 71, but not tapeinocephalic, the length-height index being 76; his stature had been something under 5 feet, either as calculated from the long bones or by simple measurement of the skeleton as laid out and increased by the addition of one inch for calcaneal and cranial integuments. The age had been something between 25 and 30, the absence of wear on the wisdom teeth being deceptive owing to the non-development of one of these teeth and the small size of another. The owner of the skeleton had suffered from infantile cerebral hemiplegia, the right humeous being half an inch longer, and the right radius $\frac{8}{10}''$ longer than the corresponding bone on the left side, whilst the femur were equal in length, and the right tibia only $\frac{2}{10}''$ longer than the left. This pathological condition, however, did not account for some very striking characters of the limb-bones, which were equally prominent on both sides of the body: these being the platyenemy of the tibiæ, the anterior convexity, and from side to side flattening of the humeri, and the curved upward end of the illux. Altogether the osteologial peculiarities of the skeleton were as distinct evidences for its antiquity as its mode of burial.—On the excavation of three round barrows at Sigwell, near South Cadbury, in the parish of Compton, Somerset. These three round barrows belonged to the bronze age, no trace of iron, except such as had been accidently, and demonstrably so, introduced, being found in any of them. The interments in them had been in the way of cremation, and in one case the ashes had been gathered into a bark coffin and a bronze dagger placed with them. In one barrow no interment was found; in another the ashes occupied an area of only an inch in diameter; and in both cases the bones had been carefully picked out of the embers of the funeral pile and interred apart, though, in neither case, in an urn. Fragmentary pieces of coarse pottery, however, were found here and there throughout the mass of the barrows, and, though there were no flints to be found in the immediate neighbourhood, great abundance of chipped flints and some scrapers were found, and notably one very beautiful one by the Rev. J. A. Bennett, to whose association very much of the success of the exploration was due.

Physical Society, May 11.—Prof. W. G. Adams, president, in the chair.—The following candidate was elected a Member of the Society: Rev. P. Magnus, B.A., B.Sc.—Mr. J. Norman Lockyer, F.R.S., read a paper on some recent researches in solar chemistry, a report of which is deferred for the present.—Sir William Thomson, LL.D., F.R.S., described and exhibited the apparatus he has employed in recent researches on the influence of stress on magnetisation, a detailed account of which he has submitted to the Royal Society; he also, in part, described them at the Royal Institution on May 10, but attention was not then directed to the experimental details now brought before the Society. The rod or wire under examination was surrounded by two co-axial wire helices, the outer of which was connected with the battery, and the inner with a ballistic galvanometer, that is, one that acts with regard to electric impulses just as Robins' ballistic pendulum. It was some years ago discovered by Villari that a longitudinal pull augments the temporary induced magnetism of soft iron bars or wires when the magnetising force is less than a certain critical value, and diminishes it when the magnetising force exceeds that value; in either case the residual magnetism is augmented when the force is applied and diminished when it is removed. Sir W. Thomson has found the critical value for soft iron to be about twenty-four times the vertical component of the earth's magnetic force. It is therefore approximately 10 C.G.S. units. In the case of some bars of nickel and cobalt specially prepared for him by Mr. Wharton, of Philadelphia, he finds opposite effects. With the amounts of magnetising force used the effect of pull was to diminish magnetisation, but the amount of this effect was less with the highest magnetising forces than with a certain degree of magnetising force which was found to make it a maximum with probably or possibly a critical value. But this value had not been reached by the magnetising force hitherto applied. The next branch of the inquiry had reference to the transverse stress obtained by water pressure within a gun-barrel, and it was ascertained to have opposite effects to those found by Villari in the case of longitudinal pull. The critical point in soft iron for transverse pull is at about 25 C.G.S. units. Sir W. Thomson has been examining the effect of torsion on a wire that is at the same time exposed to longitudinal pull, confining himself in his first set of experiments to magnetisation under the sole influence of the vertical component of terrestrial magnetism. His results showed, with every amount of longitudinal pull, a diminution of magnetisation produced by torsion in either direction, thus extending a conclusion arrived at by Matteucci, Wertheim, and Wiedemann, regarding the effect of torsion unaccompanied by longitudinal stress. But it now appears that this effect of torsion is very remarkably diminished by a large pulling force nearly reaching the limits of elasticity. In conclusion, Sir W. Thomson called attention to a very different and extremely interesting effect of torsion discovered by Wiedemann—the development of longitudinal magnetisation in an iron wire by twisting it while a current of electricity is flowing along it. This effect, he pointed out, is just what would result from the æolotropic susceptibility for magnetisation due to the æolotropic stress produced in the outer portion of the wire by the torsion, supposing the tangential magnetising force to be less than a certain critical value intermediate between the Villari critical value and the more than twofold greater critical value which Sir W. Thomson has found for transverse magnetising force. But he pointed out that another cause was also positively or negatively efficient in contributing to Wiedemann's result. This cause is the difference of electric conductivity in different directions

which may be inferred from Sir W. Thomson's early experiments and from Mr. Tomlinson's recent confirmations and extensions of the conclusions to which he was led regarding the effect of stress on the electric conductivity of metals. It is much to be desired that Mr. Tomlinson should continue his experiments; but in the meantime it seems probable that the electric conductivity in the outer parts of an iron wire twisted within its limits of torsional elasticity is maximum and minimum in the two spirals at 45° to its length, being minimum in that one of them which is of the same name as the twist, that is, the one in the direction of the maximum extension of the substance; and the conductivity is a maximum in the other 45° spiral which is the direction of maximum contraction of the substance. The effect of this æolotropic conductivity, if it exists, must be to cause the electric currents to flow in spirals of opposite spirality to that of the twist and to produce a corresponding amount of longitudinal magnetisation. The effect of this is to develop, at the end by which the current enters, a true south pole when the twist is right-handed, and a true north pole when left-handed, which is opposite to Wiedemann's result. And if the tangential magnetising force exceeds the critical value, the effect of the æolotropic magnetic susceptibility also is opposite to Wiedemann's result. This is a subject of great interest, and requires further investigation.

Photographic Society, May 14.—J. Glaisher, F.R.S., president, in the chair.—Papers were read by Capt. Abney, R.E., F.R.S., on photography at the least refrangible end of the spectrum, and on some photographic phenomena, by W. England, on dry plate processes, and by T. S. Davis, F.C.S., on a tourist's preservative dry plate process.—Capt. Abney in his paper described the means by which he obtained a photograph of the spectrum beyond the B red line by using one of Rutherford's reflection gratings containing 17,280 lines to the inch, which gives a double spectrum outside a central white light, the resulting negative contained 130 perfectly defined lines, many never yet seen by the human eye, the wave length of the lowest lines being about 10,000 tenth metres.

ROME

R. Accademia dei Lincei, Mar. 3.—The following, among other papers, were read:—Geological and palæontological studies on the middle cretaceous of Southern Italy, by M. Sequenza.—On the Italian expedition to Equatorial Africa, by M. Correnti.—On pensile shoots, with measurements of the vertical and horizontal angles, by M. Robert.—Prehistoric Calabrian objects, by M. Ruggeri.—Graphic determination of the forces in reticular woodwork, by M. Favero.—Statistics of the mortality, diseases, and reforms of the Italian army from 1860 to 1875, compared with those of other European armies, by M. Sormano.—On the nummulitic horizon near Castelnuovo dell'Abate, in the province of Siena.

PARIS

Academy of Sciences, June 10.—M. Fizeau in the chair.—The following among other papers were read:—On the cubes or prisms of M. Rohart for the destruction of phylloxera, by M. Chevreul. He finds they contain about thirty per cent. sulphide of carbon. Their efficacy surprises him.—On the large number of joints, mostly perpendicular to each other, which divide the meteoric iron of Santa Catharina (Brazil), by M. Daubrée. In a weight of 23 kilos. were found 1,350 small fragments of iron, each about 17 grammes weight; this would give 25,000 for the 500 kilos. which have come to Europe.—On the source of excito-sudorsal nerve-fibres of the anterior limbs of the cat, by M. Vulpian. They come principally from the spinal nerve, with the spinal roots of the upper thoracic ganglion; but some come directly from the cord by the roots of the nerves forming the brachial plexus.—Experiments proving that the nerve-fibres, whose excitation causes dilatation of the pupil, do not all proceed from the cervical cord of the great sympathetic, by M. Vulpian. Some come directly from the encephalon, mixed probably with fibres of cranial nerves, whose branches enter into connection with the ophthalmic ganglion.—M. Lecoq de Boisbaudran was elected Correspondent for the Section of Chemistry, in room of the late M. Malaguti.—On the geographical distribution of Mexican Graminese, by M. Fournier. He has brought the number up to 638. He divides them into two groups, the one special to Mexico, or partly common to the Andine and northern regions, distinguished by slenderness of leaves and panicles; and the other expanded in the tropical region and noted for larger size. The former inhabit, by preference, mountainous and dry parts; the latter the banks of rivers and moist parts.—On the artificial production of natron or natural carbonate of soda, by the action of carbonate of magnesia on chloride of sodium, by M. Cloez. This is done at ordinary temperature. The author thinks the phenomenon may occur in nature, explaining at once the production of natron and the large quantity of chloride of magnesium found in solution in the water of salt lakes.—On modifications produced in the animal system by various albuminoid substances injected into the vessels, by MM. Bechamp and Baltus. They experimented on dogs both with solutions of natural albumen and with pure albumens of known rotatory power. The latter were not, or were only partly, eliminated.—Influence of the physical state of gallium on its electro-chemical *rôle*, by M. Regnault. He made a small couple (about 489 mm.) of which the two metallic elements were solid and liquid gallium, and were connected by a layer of neutral sulphate of gallium dissolved in water. This caused, in a fine wire galvanometer, constant deflections of more than 40°, in a direction showing that the sheet of liquid had negative tension, while the solid plate had positive. This proves the influence of heat of constitution of a simple metallic body on the energy of its chemical properties.—On starch, by MM. Musculus and Gruber. They give a list of substances produced at expense of starch under the influence of diastase or diluted and boiling sulphuric acid.—Action of fluoride of boron on certain classes of organic compounds, by M. Landolph. Fluoride of boron combines indefinite proportions, equivalent for equivalent, with aldehydes, with acetones, and with carbonyles.—Researches on the peptones, by M. Henninger. These researches seem to indicate that the peptones result from a fixation of water on albuminoid matters, and they thus confirm a hypothesis enunciated by M. Dumas more than thirty years ago that pepsine causes the liquefaction of azotised matters by a phenomenon similar to that of diastase on starch.—Anatomical observations on certain cutaneous excretory glands in the fluviatile tortoises of China, by M. Rathonis. These glands are distinct from those formerly described by Owen and others; their physiological *rôle* is unknown.—Presence and *rôle* of ammoniacal salts in modern seas, and in the saliferous strata of all ages, by M. Dieulafait. All mineral waters, whether sulphurous or not, whether thermal or not, must contain anomalous quantities of ammoniacal salts.—Experimental proof of the incomplete crossing of the nerve-fibres in the chiasma of the optic nerves; longitudinal and median section of the chiasma not followed by blindness, by M. Nicati.

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